FUMIGANT ALTERNATIVE TO METHYL BROMIDE FOR POLYETHYLENE MULCHED TOMATO

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Tomato (*Lycopersicon esculentum* Mill.) was grown during the spring of 1995 to evaluate fumigant or combinations of chemicals as possible alternatives to methyl bromide. In past studies, 1,3-dichloropropene + 17 % chloropicrin (1,3-D + C17) provided control of nematodes and soil fungi. With the addition of pebulate, some nutsedge control was also obtained. Tomato fruit yield with the 1,3-D + C17+ pebulate treatment was 86% of that obtained with the methyl bromide treatment.

Polyethylene mulched tomatoes were grown with drip irrigation on an Arrendondo fine sand at Gainesville, FL on a site infested with purple and yellow nutsedge (*Cyperus rotundus* L. and *Cyperus esculentus* L.), root-knot nematode (*Meloidogyne incognita* (Kofoid & White) Chitwood) and soil pathogenic fungi. Beds 1.8 m apart were made, and 40% of the fertilizer was applied in rows 0.9 m apart. The soil was tilled, then soil fumigants, herbicide treatments, drip tubing, and polyethylene mulch were applied. Soil injected fumigants were methyl bromide-chloropicrin (450 kg·ha^{-1} MBr 98%- Pic 2%), methyl bromide-chloropicrin (392 kg·ha^{-1} MBr 67%-33%), chloropicrin (390 kg·ha^{-1}) and pebulate (4.5 kg·ha^{-1}), and 1,3-D + C17 (327 liter·ha^{-1}) and pebulate (4.5 kg·ha^{-1}). Metham sodium (935 liter·ha^{-1}) was applied by drip irrigation after pebulate (4.5 kg·ha^{-1}) was applied. Pebulate treatments were applied on the bed surface and incorporated 15 to 20 cm before fumigants were applied. Soil fumigants were inject ed with three chisels per bed. Dazomet (448 kg·ha^{-1}) was applied on the bed surface, incorporated and then irrigated with 6 mm depth of water before application of pebulate (4.5 kg·ha^{-1}) and the mulch.

Fruit was harvested and graded into marketable extra-large, large, and medium sizes. Yields of fruit in all size categories were influenced by fumigant treatment (Table 1). Yields of extra-large and total marketable fruit were higher and statistically similar with MBr 98-2, MBr 66-33, chloropicrin + pebulate, and 1,3-D + C17 + pebulate. Yields were intermediate with dazomet + pebulate and with drip applied metham sodium + pebulate. Nutsedge control was significantly better with the two MBr treatments and pebulate containing treatments except metham sodium + pebulate than with no treatment. Nutsedge counts averaged 2.8 plants per 0.095 m^2 with the former group of treatments, 10 per 0.095 m^2 with metham sodium + pebulate, and 16 per 0.095 m^2 with no fumigant (Table 1).

Table 1. Fumigant effects on tomato yield and control of nutsedge root-knot nematode galls, and soil pathogenic fungi.

Treatment[z]	Yield ($T \cdot ha^{-1}$) Ex. large	Yield ($T \cdot ha^{-1}$) Total	Nutsedge no. per 0.095 m^2	Gall indices[y]	Total fungi[x]
MBr 98-2	17a[w]	44ab	2c	0.2c	4.3c
MBr 66-33	15ab	42abc	4c	0.4c	4.3c
Pic + pebulate	17a	49a	2c	0.9c	4.3c
C17 + pebulate	16ab	44ab	3c	0.5c	3.8c
Dazomet + pebulate	11b	36cd	3c	2.1bc	8.7abc
Metham Na + pebulate	12b	33d	10b	3.9b	6.8c
Untreated	5c	20e	16a	6.3a	14.3a

[z]Treatment rates in text.
[y]Root-knot gall indices 0-10 with 0 = no galls, 10 = 100% of root system galled.
[x]Total pathogenic fungi infecting tomato roots included *Rhizoctonia solani*, *Macrophomina phaseolina*, , and *Fusarium* spp.
[w]Mean separation by Duncan's Multiple Range test, 5% level.

Meloidogyne incognita was the major nematode species present and control was significantlllly better with several treatments than with no treatment (Table 1). Root-knot nematode galling indices were significantly lower with soil treatments of MBr 98-2, MBr 66-33, chloropricrin + pebulate, and 1,3-D + C17+pebulate than with no fumigant treatment. Galling indices were intermediate with dazomet + pebulate and with drip applied metham sodium + pebulate but were significantly lower than with no treatment.

Three predominate pathogenic fungi, *Rhizoctonia solani* Kuhn, *Macrophomina phaseolina* Tassi (Goidanich), and *Fusarium* spp., were recovered from tomato roots in mid-May. Assessments were based on the number of fungal colonies (acidified potato dextrose agar) per nine root clumps per plot. Colony counts of *Macrophomina phaseolina* were significantly lower with all treatments than with no treatment. The count of the combined total of fungi recovered were significantly lower with treatments of MBr 98-2, MBr 66-33, chloropricrin + pebulate, and 1,3-D + C17+pebulate than with no fumigant treatment (Table 1).

Marketable fruit yield correlated negatively with nutsedge numbers, root-knot nematode galling indices, and total fungal colonies in roots. In these studies, two treatments, chloropricrin + pebulate, and 1,3-D + C17+pebulate, provided control of these pests and fruit yields compared to those obtained with the standard MBr treatments.